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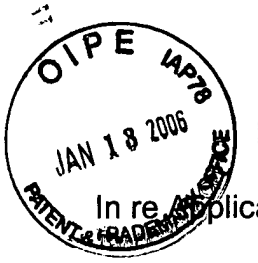

Patent
Docket No. 7516-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Bruce MacMillan

Application No.:	10/634,171	Examiner:	Berhane, Adolf D.
Date Filed:	August 5, 2003	Group:	2838

For: **METHOD AND APPARATUS FOR POWER CONVERSION HAVING A FOUR-QUADRANT OUTPUT**

BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

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Sir:

This Appeal Brief is being filed in triplicate together with an authorization for fees in the amount of $250.00 for filing an appeal brief pursuant to 37 C.F.R. § 1.192. The fee for appeal was timely filed with the Notice of Appeal on November 14, 2005. If, however, the fees paid are deemed to be insufficient, authorization is hereby given to charge any deficiency to the undersigned's Deposit Account No. 50-0951.

REAL PARTY IN INTEREST

The real party in interest in this application is the assignee, JL Audio, Inc. of Miramar, Florida.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to the Appellant.

STATUS OF CLAIMS

Claims 1 through 20 are pending in the application. Claims 18 through 20 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,429,629 to Tranh To Nguyen ("Nguyen"). Claims 1 through 20 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,283,667 to Dinger ("Dinger").

STATUS OF AMENDMENTS

A response dated September 15, 2005, was filed subsequent to the final rejection. The response included a very minor amendment to Claim 18. The Examiner's Advisory Action mailed September 26, 2005, refused to enter this minor amendment. Such amended claim 18 is reflected in the attached set of claims. Claims 1-20 remain in the Application.

SUMMARY OF THE INVENTION

The Appellant's embodiments of the invention concerns a method and apparatus for power conversion having a four-quadrant output. More particularly, the embodimenst provide for a four-quadrant output from a single switching converter that has no theoretical limit on its output voltage and does not require the use of two converters. One of the output terminals of the apparatus can be in common with one of terminals of the input voltage source as the output is single ended, allowing the desirable combining of outputs of two of the four-quadrant converters to a single load in a bridge configuration. Moreover, the apparatus provides an output current independent of an output voltage, where the output voltage is unconstrained by an input

voltage from the input voltage source and the power converter operates in all four voltage current quadrants. The apparatus can include a switching arrangement enabling an output terminal to be in common with an input terminal. See Paragraphs [0006]-[0009] of Applicant's Specification.

ISSUES ON APPEAL

1. Whether claims 18-20 are anticipated by Nguyen under 35 U.S.C. § 102(b)?

2. Whether claims 1-20 are anticipated by Dinger under 35 U.S.C. § 102(b)?

GROUPING OF THE CLAIMS

The claims are grouped as follows:

Group 1 – claims 1-13; and

Group 2 – claims 14-17; and

Group 3 – claims 18-20.

These groups of independent and dependent claims are believed to be separately patentable for the reasons set forth in the argument section of this brief, and do not necessarily stand or fall together.

A. Group 1: Claims 1-13

Appellant's claims 1-13 recite a power converter comprising an input voltage

source, an output current independent of an output voltage where the output voltage is unconstrained by an input voltage from the input voltage source and the power converter operates in all four voltage current quadrants, and a switching arrangement enabling an output terminal to be in common with an input terminal.

As noted above the output voltage in Dinger fails to be unconstrained by an input voltage (from the input voltage source) as recited in Applicant's independent claim 1. Dinger's output (load) voltage is clearly constrained by the input voltage. Dinger further appears to fail to teach a switching arrangement that enables an output terminal to be in common with an input terminal. With respect to claim 4, Dinger's "Summing Amp and Phase Shift Circuit" fails to appear equivalent to the Pulse width modulator claimed herein. Dinger's signaling also fails to lack the time relationship(s) described in the application and recited in various dependent claims such as claims 7-10.

B. Group 2: Claims 14-17

In a variant embodiment, Appellant's claims 14-17 recite a power converter comprising an inductor having at least two windings wherein at least one set of respective common terminals of the windings are in opposite phase, and an input voltage source selectively coupled to the inductor and to an output terminal of the power converter such that an output current remains independent of an output voltage and the output voltage is unconstrained by an input voltage from the input voltage source. The power converter operates in all four voltage current quadrants. As discussed above, Dinger fails to be unconstrained by an input voltage and fails to teach a switching arrangement that enables an output terminal to be in common with an input terminal.

With respect to claim 15-17, Dinger's "Summing Amp and Phase Shift Circuit" fails to appear equivalent to the Pulse width modulator claimed herein. Dinger also appears to lack bi-directional switches controlled by a pulse width modulator (as recited in claim 15) as well as a capacitor coupled between the output terminal and a negative terminal of input voltage source, where the capacitor filters a pulsating output current that flows when the third switch is turned on as recited in claim 17.

C. Group 3: Claims 18-20

Appellant's claims 18-20 recite a method of power conversion comprising the steps of selectively converting an input signal to an output signal operating in four voltage-current quadrants and selectively coupling at least one output terminal with an input terminal where an output current is independent of an output voltage and the output voltage is unconstrained by an input voltage of the input signal.

As noted in the argument below, the examiner gave a broad interpretation to Nguyen. Nguyen only operates in one voltage-current quadrant in any particular arrangement or embodiment. To avoid such broad interpretation, the Applicant amended the claim language to state that applicant's device operates "in four voltage-current quadrants" instead of stating "any one" of four voltage current quadrants in Applicant Amendment After Final dated September 15, 2005.

ARGUMENT

I. Summary

As set forth below, although Dinger does discuss being able to operate in all four voltage-current quadrants, the Applicant fails to see how the output voltage in Dinger is unconstrained by an input voltage from the input voltage source as recited in independent claim 1. Further, the Applicant fails to see how Dinger includes a switching arrangement that enables an output terminal to be in common with an input terminal. Additionally, Dinger appears to fail to teach or suggest, mention or contemplate quite a few elements as recited in the dependent claims as will be further discussed below.

With respect to Nguyen, the examiner gives a overly-broad or mischaracterized interpretation to such cited art inasmuch as Nguyen fails to operate in four voltage-current quadrants. The examiner is further using improper hindsight inasmuch as Nguyen was discussed and differentiated in Applicant's background of the specification and throughout prosecution.

Applicant thus believes that until the Examiner clearly shows how each element of the claims is clearly anticipated by the cited references, a rejection based on Dinger or Nguyen under 35 U.S.C. Section 102(b) is misplaced. Applicant also respectfully submits that claims 1-20 are novel and non-obvious and overcome the rejection based on Dinger under 35 U.S.C. Section 102(b) and that claims 18-20 are likewise novel and non-obvious and overcome the rejection based on Nguyen under 35 U.S.C. Section

102(b).

II. A) The Dinger Reference

Dinger relates to a motor field exciter and exciter circuit for an electrical load such as the field winding of a direct current (DC) motor. The exciter circuit regulates the DC current applied to the load from an alternating current (AC) source in response to an isolated feedback signal developed by means of a saturating square loop current transformer. The Dinger reference includes embodiments for both single and bidirectional current flow through the load which comprises the field winding of the DC motor.

B) The Nguyen Reference.

Nguyen discusses converters that have a center-tapped wound magnetic element or transformer with a DC input applied to the center tap and switches from each winding end to ground. The converters in Nguyen only operate in one voltage-current quadrant (positive voltage, positive current or negative voltage, negative current) as opposed to all four quadrants. Although Nguyen states that the converters shown in FIGs. 3A-3J therein are capable of output of "any polarity and magnitude", it should be understood that all of the converters in Nguyen operate inherently in one quadrant depending on the direction of the diodes or synchronous rectifiers and that the output magnitude is constrained by the input voltage and the turns ratio of the transformer.

III. Deficiencies of Cited References

A. The Examiner rejected claims 1-20 under 35 U.S.C. Section 102(b) as being anticipated by U.S. Patent No. 4,283,667 to Dinger ("Dinger"). Although Dinger does discuss being able to operate in all four voltage-current quadrants, the output voltage in Dinger fails to be unconstrained by an input voltage (from the input voltage source) as recited in Applicant's independent claim 1. Dinger's output (load) voltage is clearly constrained by the input voltage. The output voltage in Dinger must be less than or equal to the peak voltage between L2 and L3, or, in the case of Dinger's Fig 10, the peak voltage between transformer center tap 378 and either terminal 380 or terminal 384, where this peak voltage is related to the input voltage across L2 and L3 by the fixed transformer ratio. Further, as recited in claim 1, the Applicant fails to see how Dinger includes a switching arrangement that enables an output terminal to be in common with an input terminal. Additionally, Applicant could not find a mention of a "capacitor filter (C1)" nor a "third switch (Q1)" in Dinger. (See Final Rejection, Page 2.).

Additionally "Summing Amp and Phase Shift Circuit (27)" of Dinger does not appear equivalent to a Pulse Width Modulator as presently claimed. Although the circuit does create pulse signals "A" and "B" that control switches, Dinger's description further explains that their circuit operates by changing the phase of these signals relative to a reference signal "F" and that an additional and separate circuit, that of Dinger's Fig. 6, creates an additional switch-control signal "C" to serve as a "lockout" signal. This signal does not appear equivalent to any of the switch control signals or pulse width modulator

as recited in the present invention as it is unrelated in time to the other signals "A" and "B". Furthermore, these signals lack the time relationship described in the application and recited in various dependent claims. In particular, see claims 7-10 and 19-20.

Dinger appears to fail to teach or suggest, mention or contemplate quite a few elements in other dependent claims as well. For example, as recited in claim 3, there is no teaching that the windings of the single inductor are tightly coupled magnetically. The Applicant fails to see bi-directional switches that are controlled by a pulse width modulator as recited in claims 4 and 15. Although Dinger illustrates a "Summing Amp and Phase Shift Circuit 27", this does not appear to be equivalent to a pulse width modulator. (See FIG. 7 and corresponding description starting on col. 11, line 41 in Dinger). With respect to claim 6, Dinger appears to fail to include a capacitor between an output terminal and a negative terminal of an input voltage source, particularly a capacitor that filters a pulsating output current that flows when a third switch is turned on. Where is this taught in Dinger?

Dinger certainly fails to illustrate, suggest or contemplate a pulse width modulator that controls switches such that a third switch is on when neither a first switch or a second switch is on and such that the first switch and the second switch cannot be on at the same time as recited in claim 7. Further, Dinger fails to show a plurality of switches that operate in a cyclical sequence and at a constant frequency as recited in claim 8 or a third switch that has an on-time that is constant and less than a period of the cyclical sequence as recited in claim 9. Dinger further fails to show the closure of the first

switch causing current flow into a reference phase inductor terminal to increase while the second switch causes current flow into a second reference phase inductor terminal to decrease such that a greater on-time among the first switch and the second switch determines the polarity of the output voltage as recited in claim 10. Inasmuch as Dinger is a motor field exciter for driving a field winding of a DC motor, the particular circuitry and purposes in Dinger are clearly different from the claimed invention herein as well.

B. The Examiner rejected claims 18-20 under 35 U.S.C. Section 102(b) as being anticipated by Nguyen. As noted above, the examiner gives a broad interpretation to such cited art, particularly with respect to claim 18 since the claim previously stated that it "operates in any one of four voltage current quadrants." As noted above, Nguyen only operates in one voltage-current quadrant. To remove such broad interpretation, the Applicant amended the claim language to state that applicant's device operates "in four voltage-current quadrants" instead of stating any one of four voltage current quadrants in Applicant's Amendment After Final dated September 15, 2005.

Nguyen discusses converters that have a center-tapped wound magnetic element or transformer with a DC input applied to the center tap and switches from each winding end to ground. The converters in Nguyen only operate in one voltage-current quadrant (positive voltage, positive current or negative voltage, negative current) as opposed to all four quadrants as clearly recited in the claimed invention in independent claims 1, 14, and 18. The output voltage magnitude in Nguyen is also constrained by

the input voltage. Nguyen states that the converters shown in FIGs. 3A-3J are capable of output of "any polarity and magnitude." However, as discussed above, it must be understood that all of the converters in Nguyen operate inherently in one quadrant depending on the direction of the diodes or synchronous rectifiers and that the output magnitude is constrained by the input voltage and turns ratio of the transformer as stated on column 3, lines 47 through 52 of Nguyen. Thus, since the claims specifically recite operation in all four voltage current quadrants and further recite an output voltage unconstrained by the input voltage, the present invention is novel and certainly not obvious in view of the cited art. Further, it would also seem to be improper use of hindsight to attempt to use Nguyen as a reference to try to obviate the recited claims, particularly in view of the novel and nonobvious differences discussed above and in Applicant's background section.

CONCLUSION

Applicant thus believes that until the Examiner clearly shows how each element of the claims is clearly anticipated by the cited references, a rejection based on Dinger or Nguyen under 35 U.S.C. Section 102(b) is misplaced.

The Federal Circuit emphasizes that anticipation is found only if ALL the elements of an invention, as stated in a patent claim, are IDENTICALLY set forth in a single prior art reference. It is not sufficient to find anticipation by citing a reference that discloses substantially the same things. Dinger and Nguyen may appear similar to the claimed invention on a superficial level, but they are quite different from the claimed

invention as discussed above. A single cited reference by the Examiner fails to include a method or device that operates in all four voltage-current quadrants that has an output current independent of an output voltage and where the output voltage is unconstrained by an input voltage of the input signal among other differences. The Applicant believes the Examiner has clearly failed to establish anticipation of the claims herein with the cited references. Neither the Dinger nor Nguyen reference, relied upon in rejecting claims 1-20 under 35 U.S.C. § 102(b), disclose all of the limitations recited in the claims.

Accordingly, Appellants believe that the claimed method and apparatus as defined in claims 1-20, are not anticipated under 35 U.S.C. § 102(b) by the Dinger or Nguyen reference. It is thus submitted that claims 1-20 define a patentably distinguishable invention over the prior art made of record, and a Notice of Allowance for claims 1-20 is accordingly and courteously solicited.

Respectfully submitted,

Date: Jan. 13, 2006

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Docket No. 7516-1

APPENDIX

What is claimed is:

1. (Previously Presented) A power converter, comprising:

an input voltage source;

an output current independent of an output voltage, wherein the output voltage is unconstrained by an input voltage from the input voltage source and the power converter operates in all four voltage current quadrants; and

a switching arrangement enabling an output terminal to be in common with an input terminal.

2. (Original) The power converter of claim 1, wherein the power converter further comprises a single inductor with two windings.

3. (Original) The power converter of claim 2, wherein the windings of the single inductor are tightly coupled magnetically.

4. (Original) The power converter of claim 2, wherein the switching arrangement comprises a plurality of bidirectional switches coupled to the single inductor, wherein the plurality of bidirectional switches are controlled by a pulse modulator.

5. (Original) The power converter of claim 4, wherein the plurality of bi-directional switches comprises a first switch coupled to a first terminal of the single inductor and to a positive terminal of the input voltage source, a second switch coupled to another terminal of the single inductor and to the positive terminal of the input voltage source, and a third switch coupled the first terminal of the single inductor and to the output terminal.

6. (Original) The power converter of claim 5, wherein the power converter further comprises a capacitor coupled between the output terminal and a negative terminal of input voltage source, wherein the capacitor filters a pulsating output current that flows when the third switch is turned on.

7. (Original) The power converter of claim 5, wherein the pulse modulator controls the plurality of switches such that the third switch is on when neither the first switch nor second switch is on and such that the first switch and the second switch cannot be on at the same time.

8. (Original) The power converter of claim 5, wherein the plurality of switches operate in a cyclical sequence and at a constant frequency.

9. (Original) The power converter of claim 8, wherein the on-time of the third switch is constant and less than a period of the cyclical sequence.

10. (Original) The power converter of claim 5, wherein the closure of the first switch causes current flow into a reference phase inductor terminal to increase while the second switch causes current flow into a second reference phase inductor terminal to decrease such that a greater on-time among the first switch and the second switch determines the polarity of the output voltage.

11. (Original) The power converter of claim 1, wherein the power converter can operate as at least one among the group comprising a buck-boost converter, an AC-to-DC converter, and an amplifier.

12. (Previously Presented) The power converter of claim 1, wherein the power converter further comprises a single inductor with at least one winding and wherein the switching arrangement enables the output terminal to be selectively in common with the input terminal.

13. (Original) The power converter of claim 1, wherein the power converter further comprises a single inductor having a single winding and wherein the switching arrangement comprises a plurality of bidirectional switch pairs coupled to the single inductor.

14. (Previously Presented) A power converter, comprising:

an inductor having at least two windings wherein at least one set of respective common terminals of the windings are in opposite phase;

an input voltage source selectively coupled to the inductor and to an output terminal of the power converter such that an output current remains independent of an output voltage and the output voltage is unconstrained by an input voltage from the input voltage source; and

wherein the power converter operates in all four voltage current quadrants.

15. (Original) The power converter of claim 14, wherein the input voltage source is selectively coupled to the transformer using a plurality of bidirectional switches coupled to the transformer, wherein the plurality of bidirectional switches are controlled by a pulse modulator.

16. (Original) The power converter of claim 15, wherein the plurality of bi-directional switches comprises a first switch coupled to a first terminal of the transformer and to a positive terminal of the input voltage source, a second switch coupled to another terminal of the transformer and to the positive terminal of the input voltage source, and a third switch coupled the first terminal of the transformer and to the output terminal.

17. (Original) The power converter of claim 16, wherein the power converter further comprises a capacitor coupled between the output terminal and a negative terminal of input voltage source, wherein the capacitor filters a pulsating output current that flows when the third switch is turned on.

18. (Currently Amended) A method of power conversion, comprising the steps of:

selectively converting an input signal to an output signal operating in ~~any one of~~ four voltage-current quadrants; and

selectively coupling at least one output terminal with an input terminal, wherein an output current is independent of an output voltage and the output voltage is unconstrained by an input voltage of the input signal.

19. (Original) The method of power conversion of claim 18, wherein the step of selectively converting the input signal to the output signal comprises switching a plurality of bidirectional switches controlled by a pulse modulator.

20. (Original) The method of power conversion of claim 18, wherein the step of selectively coupling the at least one output terminal with the input terminal comprises switching a bidirectional switch among a plurality of switches that operate in a cyclical sequence such that an on-time of the bidirectional switch is a constant amount of time during a period of the cyclical sequence.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	10/634,171	Confirmation No.: 6345
Applicant	:	MacMillan, Bruce	
Filed	:	August 5, 2003	Examiner: Berhane, Adolf D.
TC/A.U.	:	2838	
For	:	METHOD AND APPARATUS FOR POWER CONVERSION HAVING A FOUR-QUADRANT OUTPUT	

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Please charge any deficiencies or credit any overpayment to Deposit Account No. 09-0461.

Respectfully submitted,

Dated: January 13, 2006

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Docket No. 7516-1

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January 13, 2006
Date

_____, Reg. No. 33,739
Pablo Meles, Esquire

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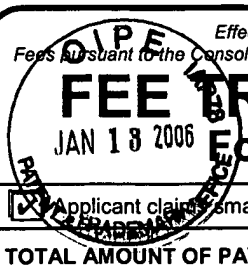

Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL For FY 2005

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) $250.00

Complete if Known	
Application Number	10/634,171
Filing Date	August 5, 2003
First Named Inventor	Bruce MacMillan
Examiner Name	Adolf D. Berhane
Art Unit	2838
Attorney Docket No.	7516-1

METHOD OF PAYMENT (check all that apply)

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☑ Deposit Account Deposit Account Number: 50-0951 Deposit Account Name: Akerman Senterfitt

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims		Extra Claims	Fee ($)	Fee Paid ($)
_____	- 20 or HP =	_____	x _____	= _____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		Extra Claims	Fee ($)	Fee Paid ($)
_____	- 3 or HP =	_____	x _____	= _____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____	- 100 =	_____	/ 50 = _____ (round up to a whole number)	x _____	= _____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other (e.g., late filing surcharge): Filing a brief in support of an appeal	$250.00

SUBMITTED BY

Signature	Pablo Meles	Registration No. (Attorney/Agent) 33,739	Telephone 954 463-2700
Name (Print/Type)	Pablo Meles		Date January 13, 2006

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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